

THE GLOBAL **SMART ENERGY** ELITES 2015



PROJECTS AND PEOPLE

The definitive guide to the Projects & People driving global
smart grid development

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**METERING &
SMART ENERGY**
INTERNATIONAL

FOREWORD

The Global Energy Elites is a publication that recognises projects that have changed the way utilities interact with their clients or have had a critical impact on the utility and its operations.

A focus on Elite projects...

The Metering & Smart Energy International editorial team had the pleasure of working through the more than 60 submissions we received in order to settle on the projects contained in this publication.

Settling on the final projects was a difficult and challenging undertaking, resulting in many intense conversations and days of checking and re-checking submissions and outcomes.

This is not an awards programme, but rather, a look at projects against which utilities of all shapes, sizes and across all regions can benchmark themselves. Because each utility has its own unique challenges, operational and regulatory environments, these are also not meant to be 'cookie-cutter' solutions for other utilities. However, they do serve as an example of how utilities the world over are challenging perceptions, innovating and embracing technology, and engaging with their customers in a completely different way.

As the utility sector continues expanding, changing and evolving, successful examples are ever more important to continue encouraging an entrepreneurial spirit in a traditionally conservative sector.

The categories we considered for the Elites were multi-faceted, interlinked and of importance to all utilities.

1. AMI & Smart Metering

Which AMI project or applications has significantly improved utility operations, efficiency or revenue collection in the past year?

2. Cyber Security

Which utility has successfully deployed technology to avert hacking, intrusions and cyber-attacks, to the benefit of both the utility and its customer base? Where has cybersecurity been

appropriately integrated and best practice developed for driving security awareness?

3. Data & analytics

Which utility has significantly improved on the way it is handling and analysing data, and what have the benefits been to both the utility and its customer base?

4. Billing and Customer engagement

Which utility has increased levels of customer satisfaction and how have they achieved these results. How has the project aligned customer expectations with the utility offering?

5. The digital utility transformation

Recognising utility that has most embraced the evolution to the digital age through implementation of smart grid, smart metering and integrated smart communication systems.

6. Smart water project

Which water utility that has seen the most benefit due to the rollout of 'smart' systems? Benefit can be measured through management of resources, revenue management or collection or improved customer satisfaction.

7. Innovation of the year

The most innovative product or project of 2014/2015.

8. Emerging market project

Acknowledging utilities in Asia, Latin America, Eastern and Central Europe and Africa, across the gas, water and electricity sectors.

9. Integration of IT and OT

Which utility has successfully integrated information technology (IT) and operational technology (OT) for more streamlined operations?

10. Demand response project

Which utilities have successfully integrated a demand programme for better energy efficiency or seen a measurable improvement in electricity/water or gas usage?

and Elite people

Without great people, great projects or innovation or vision will fail to materialise, and we are pleased to recognise a collection of people from around the world who are driving that innovation and vision. They are involved in the smart energy sector either as vendors, utility personnel or association leaders – each one of them driving excellence in their particular field.

Speaking of Elite people... we'd like to thank our friends and advisors at KPMG, VaasaETT, I.H.S and Northeast Group for assisting us in the final selections. Your help has been invaluable.

We hope you will enjoy reading more about these people and the projects we believe are noteworthy.

Happy reading!

Claire and Amy



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Automation and digitisation improves grid reliability

Enel serves 61 million customers across 40 countries around the world; has deployed 37 million smart meters globally and has 80% penetration of distribution automation systems. This €85 billion company exhibits high system reliability through distribution network automation and fault detection, isolation and restoration.

In 2014, Enel achieved SAIDI scores of 40 minutes per customer. However, Enel is aiming to achieve a SAIDI score of 25 minutes per customer, and further improve performance.

In order to drive this improvement, reduce the occurrence of faults and improve grid reliability, Enel has been working with C3 Energy to deploy the C3 Predictive Maintenance system.

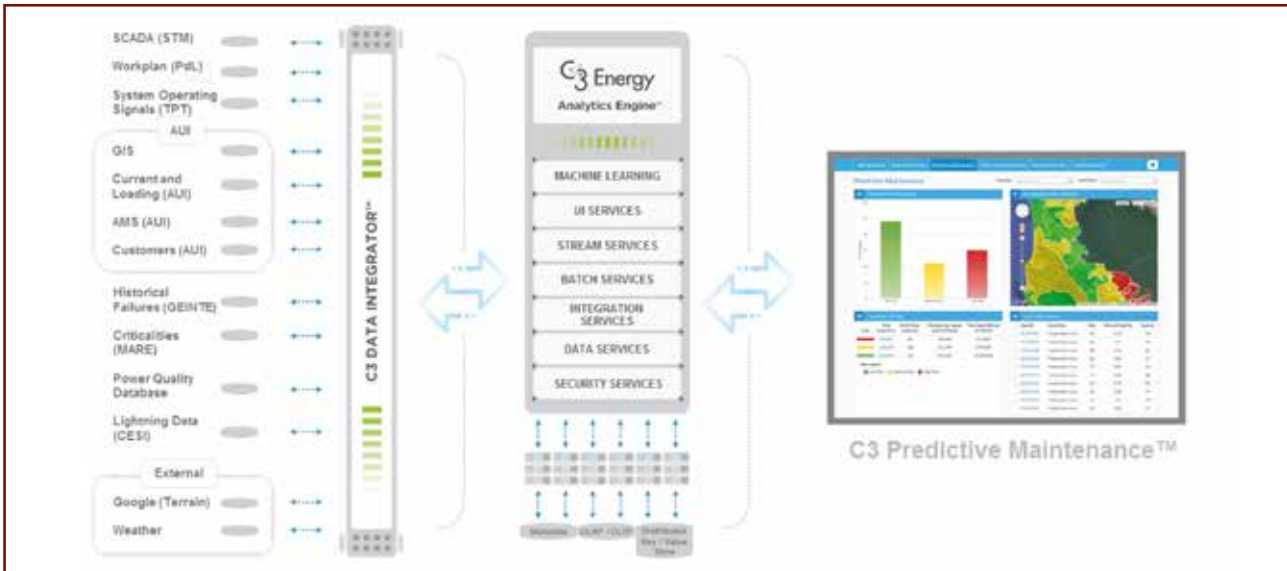
This is not Enel's first success with predictive maintenance. For the last decade, Enel had been pioneering efforts to enhance equipment performance and electricity delivery quality across multiple areas of its entire operating chain.

Enel first began these efforts in the power generation domain – the company spearheaded several predictive maintenance pilot programmes at its Brindisi power plant to identify and reduce operations-disrupting failure modes.

During early testing prior to 2008, Brindisi maintenance personnel found several equipment issues potentially addressable by predictive maintenance. Over several years, Enel teams developed an internal CSI 2130 [predictive maintenance software], uncovering and preventing issues such as in drive system hydraulic joints on gas-to-air heat exchangers, helping to avoid unplanned shutdowns that would have cost \$366,000.

More recently in 2015, Enel implemented the C3 Predictive Maintenance application for generation to identify, diagnose, and predict failures of key rotating equipment components. Teams from C3 Energy worked with Enel experts to address failures of the high pressure feedwater pump system and associated equipment, which were vulnerable to vibration-induced failure as well as cooling system seal failures. The C3 Predictive Maintenance application helped to accurately identify impending cooling system failures with greater than 15-28 day advance warning, allowing for more flexible scheduled maintenance and avoidance of emergency plant shutdowns and lost power production.

Enel has now built on this experience to extend C3 Energy's predictive maintenance capabilities to downstream components in the electric delivery system: medium voltage electric distribution feeders across Italy.



There are two key drivers of the implementation are improving network reliability and reducing maintenance costs across Enel Italy's network.

The implementation of predictive maintenance across the grid has enabled Enel to accurately predict faults on medium voltage (MV) feeders, thereby improving system reliability and reducing maintenance costs. Enel's previous predictive maintenance approach involved analysis of SCADA data and use of hand-tuned parameters to score and rank feeders-at-risk. By deploying an advanced machine-learning based framework that uses the characteristics of the MV feeders (e.g., asset age, overhead/underground, asset utilisation and duration, weather) to compute the probability and economic consequences of faults on each feeder, Enel is able to obtain a risk score for each asset and feeder in real time.

Integrate and analyse data from multiple systems in real time

The predictive maintenance system incorporates data from ten source systems, including SCADA, maintenance work orders, fault protection system, asset management, historical equipment failure, known network issues, power quality, lightning, terrain and weather.

Dynamically reconstruct the as-operated grid network state

The software is able to dynamically reconstruct the as-operated network

state for Enel's distribution system, so that signals on any network element can be accurately linked to specific feeders. For the first time, Enel's network operators are able to instantly view the configuration of any feeder at any point in time.

Apply machine learning to predict feeder section failure

With the ability to process, in real time, 748 analytics, including transformations of SCADA events, known network issues, and weather data, the predictive maintenance software uses sophisticated, two-stage machine learning to predict both the probability of feeder faults and the potential location (at the individual node or branch level) of faults to facilitate efficient inspections.

In addition to fault predictions, predictive maintenance includes a fully automated scalable algorithm to assess the performance of fault path indicators, and prioritise devices for repair/replacement.

Deliver substantial value

Results of deploying the software across 1,000 feeders in one control centre demonstrated the ability to predict, within a 30-day window, up to 37% of feeder faults. This will enable Enel to further improve network reliability and reduce maintenance costs. The annual economic benefit of deploying the predictive maintenance software across 28 control centres in Italy alone is substantial.

Enel has been named in the top five of Fortune magazine's Change the World list, a new ranking that shines a spotlight on businesses that make addressing social challenges part of their business strategy.

The Group, which is both the only utility and only Italian company to be included in the list was ranked fifth of 50 companies selected by the magazine, and was hailed by Fortune for "charging the barricades when it comes to clean power".

The magazine praised Enel for leading a renewable energy revolution, something they usually expect "to be led by tiny upstarts, not established giants", and highlighted the fact that in 2014 the Group generated 38% of its output from renewable sources, with that figure set to rise to 48% within the next four years. Fortune also singled out Enel CEO Francesco Starace's commitment to make the Group carbon neutral by 2050.

"We are delighted that Fortune has recognized the key role of the power industry in driving progress in the world and Enel's leadership within it. Electricity is fundamental for industrial and agricultural production and job creation, it improves education and healthcare, and it opens up new opportunities for growth," said CEO Starace in reaction to the news.

"Our role is to ensure an energy supply that is available to all and sustainable over the long term, and we need to make sure it is delivered in harmony with the needs of the communities it serves." ●